Drawing Amendments

In Figure 2, please change item '76' to '30' as shown in the proposed replacement sheet.

In Figure 2, please add item '64A' as shown in the proposed replacement sheet.

In Figure 3, please add item 'A' and associated arrows representing a cross section indicator.

Please add new Figure 2A as shown in the new sheet.

Remarks

Thorough examination by the Examiner is noted and appreciated.

The Specification and the drawings have been amended in an effort to further clarify the relationship between Figures 2 and Figure 3 and a new Figure 2A added as requested by Examiner.

The claims have been amended and new claims added to further clarify Applicants disclosed and claimed invention. The amendments find support in the Figures, the previously presented claims and/or the Specification. No new matter has been added.

Claim Rejections under 35 USC 103

1. Claims 1-3 stand rejected under 35 USC Section 103(a) as being unpatentable over Koike (US 2002/0079552) in view of Tatematsu (US 2002/0153588).

Koike discloses a method for opening a fuse window over a fuse structure to that avoids an extra photolithography patterning and etching step by using a polyimide upper film (42; see Figs 7 and 8) as an etching mask to etch the fuse window (50'; Figure 8; paragraphs 0060-0062). In another embodiment, the fuse window is partially etched through a passivation layer at the same time as a bond pad window is formed, and for an adjacent circuit, followed by forming the bonding pad over the adjacent circuit line and then applying the polyimide film and using it as an etching mask to etch a remaining portion of the fuse window (see Figures 11-13; paragraph 0061-0071). The fuse window is etched into a SiO2 film overlying the fuse, which is disclosed to **be copper dual damascene (copper fuse formed on underlying vias)**. Koike discloses a dual damascene process for forming the copper interconnects including copper lines (e.g., 32; Figure 15 that forms the fuse underlying the fuse window (110) (see paragraph 0055).

Koike generally disclose in a discussion of the prior art that a fuse formed by a metal interconnection layer such as Al or Cu may be blown by a laser light (paragraph 0005). Koike nowhere disclose or suggest an aluminum fuse, and such would not work

with the copper dual damascene process of Koike,

Koike nowhere discloses or suggests that the intermetal insulating layers e.g., layers 23, 29, 34; Figure 15) are formed of a low dielectric material or disclose or suggest that the cracking of intermetal insulating layers is a problem in the laser blowing of fuses.

On the other hand, Tatematsu et al. disclose a fuse **structure having one or more protective members (plugs) made of tungsten or copper underlying a disconnecting point of a fuse** in a laser fuse blowing operation to avoid damage to the insulating film underlying the fuse (see Abstract; paragraphs 0019, 0025, 0026). Tatematsu et al. teach that it is important that the protective members (plugs) (or vias) underlying the fuse have a higher melting point than the fuse (paragraph 0059). Thus, Tatematsu et al. disclose where the interconnects (wiring) in an underlying layer is formed of aluminum (13a, 13b; Figure 5A; the protective members (e.g., 14C) are made of tungsten (or copper) **and the fuse (15) made of Aluminum (spanning the distance between the interconnecting vias)** (see paragraphs 0068-0071). Tatematsu et al. disclose that the interconnecting vias (14a and 14b are

made of tungsten (see paragraph 0059, 0070; 0085 and 0086).

Although Tatematsu et al. disclose that the **protective members (plugs)** may be made of Cu, Tatematsu et al. does not show any such embodiment, and specifically teaches that **both the via interconnects in all three embodiments are made of tungsten** (paragraphs 0085, 0086, and 0089).

Tatematsu et al. further do not teach a **fuse blowing window** over the fuses, but rather teach that an opening above the fuse is formed in an overlying planar insulating silicon oxide layer (paragraphs 0060 and 0061) formed on the fuse **by a thermal explosion** due to heating of the fuse by a laser during fuse blowing (see paragraphs (0012, and 0062; Figures 3 and Figure 6A).

There appears to be no motivation to combine the disparate fuse structures of Koike and Tatematsu et al., which **operate by a different principle of operation** (i.e., Koike teach a fuse window is formed over the copper fuse where the fuse is a **dual damascene copper line** (**connected to underlying copper vias**) formed by a **dual damascene process** in contrast with Tatematsu et

al. where **an aluminum fuse without an overlying fuse window** is formed by a **single damascene process** where the fuse is in contact with underlying **tungsten vias** which in turn connect to underlying **aluminum wiring**.

Moreover, any attempt to combine the single damascene aluminum fuses and tungsten vias of Tatematsu et al. with the dual damascene copper line fuses of Koike would make the copper dual damascene process of Koike unworkable and the method of Koike unsuitable for its intended purpose.

Nevertheless, even assuming arguendo, a proper motivation for combining the teachings of Koike and Tatematsu et al., such combination does not produce Applicants disclosed and claimed invention.

The combined references nowhere teach Applicants invention including those elements in **bold type**:

"at least **two top metal lines comprising copper** in said top inter-metal dielectric layer, each of said at least two top metal lines comprising a topmost metal layer in electrical

communication with underlying copper interconnect structures extending through a plurality inter-metal dielectric layers;

a fuse comprising aluminum on said top inter-metal dielectric layer, **said fuse providing electrical communication between said at least two top metal lines** by spanning a distance between said at least two top metal lines;

a **plurality of dielectric layers comprising a lowermost passivation layer on said fuse;** and

a window formed through a thickness portion of the plurality of dielectric layers to said lowermost passivation layer, said window positioned over a top portion of said fuse."

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).*

"If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." *In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).*

Moreover, neither of the cited references has recognized or provided a solution to the problem that Applicants have recognized and solved by their disclosed and claimed invention:

"A semiconductor device fuse structure to prevent dielectric layer cracking at corner portions of associated metallization structures"

2. Claims 6, 9, 10, and 11 stand rejected under 35 USC Section 103(a) as being unpatentable over Koike in view of Tatematsu et al., above, and in further view of Hatano et al. (7,067,897).

Applicants reiterate the comments made above with respect to Koike and Tatematsu et al.

Applicants respectfully point out that Examiner is mistaken

in asserting that Kioke teach a **low-k** dielectric material layer as that term would be understood as a term of art to one of ordinary skill in the art as having a dielectric constant at least lower that SiO2.

Even assuming arguendo, a proper motivation to combine the references, the fact that Hatano et al. teach a copper fuse dual damascene structure (as does Koike) formed in a low-K intermetal dielectric, does not further help Examiner in producing Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)*.

3. Claim 12 stands rejected under 35 USC 103(a) as being unpatentable over Koike in view of Tatematsu et al., in further view of Hatano et al., above and further in view of Applicants alleged admitted prior art.

Applicants reiterate the comments made above with respect to Koike, Tatematsu et al., and Hatano et al.

Even assuming *arguendo* a proper motivation for combination, the fact that Applicants teach a broad range of thicknesses for fuses made of a large list of fuse materials, including Aluminum, does not further help Examiner in producing Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).*

4. Claim 13 stands rejected under 35 USC 103(a) as being unpatentable over Koike in view of Tatematsu et al., in further view of Hatano et al., above, and further in view Liaw (6,255,715).

Applicants reiterate the comments made above with respect to Koike, Tatematsu et al., and Hatano et al.

Even assuming *arguendo* a proper motivation for combination, the fact that Liaw teaches a thickness of a conductive wiring line (Al, AlCu, W) having a range of 2000-8000 angstroms as part of an annular guard ring structure (wiring line overlying the annular guard ring) (see e.g., claims 1,9), does not further help Examiner in producing Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)*.

"we do not pick and choose among the individual elements of assorted prior art references to recreate the claimed invention, but rather we look for some teaching or suggestion in the references to support their use in a particular claimed combination". Symbol Technologies, Inc. v. Opticon, Inc., 935

F.2d 1569, 19 USPQ2d 1241 (Fed. Cir. 1991).

5. Claims 22-26 stand rejected under 35 USC 103(a) as being unpatentable over Koike in view of Tatematsu et al., above, and further in view of Mori (US 2003/0052385).

Applicants reiterate the comments made above with respect to Koike and Tatematsu et al.

Even assuming *arguendo* a proper motivation for combination, the fact that Mori discloses a laser having a wavelength (1.3 microns) for blowing Aluminum fuses through an insulating layer over a high melting point nitride (see paragraphs -0050- 0051), does not further help Examiner in producing Applicants disclosed and claimed invention.

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).*

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).*

Moreover, none of cited references recognizes or provides a solution to the problem that Applicants disclosed and claimed invention solves including:

"A semiconductor device fuse structure to prevent dielectric layer cracking at corner portions of associated metallization structures"

Conclusion

The multiplicity of cited references fail to produce or suggest Applicants disclosed and claimed invention and therefore fail to make out a *prima facie* case of obviousness.

Based on the foregoing, Applicants respectfully request favorable consideration of their claims and submit that the Claims

are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention as claimed is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

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